The Veliger 26(4):264–273 (April 2, 1984)

THE VELIGER
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Distribution and Radular Morphology of Various Nudibranchs (Gastropoda: Opisthobranchia) from the Gulf of California, Mexico

by

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Abstract. We report new distribution records for 14 species of nudibranchs from the tropical eastern Pacific faunal region. We present scanning electron micrographs of the radulae of *Chromodoris annulata, Histiomena convolvula,* and *Flabellina cynara,* and document the gorgonian prey of *H. convolvula.*

DURING THE PAST five years, we have made numerous scuba diving research trips throughout the Gulf of California. We have found specimens of opisthobranchs that constitute significant new distributional records for the tropical eastern Pacific faunal region (Panamic province).

In this paper we report new range records of 14 species of nudibranchs, present scanning electron micrographs of the radulae of three species, and document the prey of the arminid *Histiomena convolvula.* We carefully distinguish disjunct occurrences: that is, species reported from different zoogeographical marine faunal provinces that have large gaps in their known distributional ranges.

The latitude and longitude of our collecting localities are given in Table 1, and their locations are indicated on the map (Figure 16).

DORIDOIDA

PHANEROBRANCHIA

GONIODORIDIDAE

Trapania sp.

This specimen resembles the southern Californian *Trapania velox* (Cockerell, 1901). However, its color pattern is distinct enough to warrant not immediately identifying this single specimen to the species level.

The body is white (Figures 1 and 2), with distinct chocolate-brown streaks and patches. These markings are very pronounced, clear, and sharply margined. The tips of the cephalic tentacles, rhinophores, gills, and lateral extrabranchial appendages, and the posterior extreme of the foot are a brilliant yellow.

(1) 1 specimen (20.2 mm long), subtidal, 4.5 m deep, Cabo San Lucas, Baja California Sur; *leg.* Alex Kerstitch (AK), 20 July 1981.

Specimens of this species have recently been reported from Isla Cedros and Bahía Vizcaino (BEHRENS, 1983).

CRYPTOBRANCHIA

CHROMODORIDIDAE

Chromodoris annulata Eliot, 1904

Known collecting records of *Chromodoris annulata* have been confined to the western Indian Ocean: from the Red Sea (GOHAR & ABOUL-ELA, 1957; ABOUL-ELA, 1959); Diani, Kenya (RUDMAN, 1973:189–190); Zanzibar and Dar es Salaam, Tanzania (ELIOT, 1904:389–390; EDMUNDS, 1971:371–372); and Natal, South Africa (BARNARD, 1927).

The following specimen represents the first collecting

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Table 1

Latitude and longitude of Mexican collecting localities.

Pacific coast of Baja California	
Islas Coronados, B.C.	32°25′N; 117°15′W
Ensenada, B.C.	31°51′N; 116°38′W
Isla San Martin, B.C.	30°31′N; 116°10′W
Bahia San Quintin, B.C.	30°24′N; 115°53′W
Isla Guadalupe, B.C.	29°00′N; 118°20′W
El Tomatal, B.C.	28°29′N; 114°04′W
Isla San Benitos	28°20′N; 115°40′W
Isla Cedros	28°07′N; 115°11′W
Bahía Vizcaino	27°50′N; 114°51′W
Punta Santo Domingo, B.C.S.	26°19′N; 112°40′W
Gulf of California, western shore	
Consag Rock, B.C.	31°07′N; 114°29′W
San Felipe, B.C.	31°01′N; 114°49′W
Puertecitos, B.C.	30°21′N; 114°38′W
Bahía de los Angeles, B.C.	28°57′N; 113°31′W
Isla Tortuga, B.C.	27°27′N; 111°58′W
Loreto, B.C.S.	26°01′N; 111°20′W
La Paz, B.C.S.	24°13′N; 110°25′W
Bahía Las Cruces, B.C.S.	24°13′N; 110°05′W
Cabo San Lucas, B.C.S.	22°52′N; 109°55′W
Gulf of California, eastern shore	
Puerto Peñasco, Sonora	31°18′N; 113°32′W
Bahía Kino, Sonora	28°49′N; 111°59′W
Morro Colorado, Sonora	27°58′N; 111°22′W
Bahía San Carlos, Sonora	27°56′N; 111°08′W
Guaymas, Sonora	27°55′N; 110°54′W
Mazatlan, Sinaloa	23°11′N; 106°25′W
Pacific coast of mainland Mexico	
Sayulita, Nayarit	21°20′N; 105°15′W
Melaque, Jalisco	19°12′N; 104°43′W
Santiago Bay, Colima	19°03′N; 104°19′W

Table 2

Meristic variation in the radula of *Chromodoris annulata*.

Rows	Maximum teeth/half-row
58	49
65	59
66	49
70	45
75	42

data of *Chromodoris annulata* from the eastern Pacific Ocean, and from anywhere outside the Indian Ocean:

(1) 1 specimen, subtidal, 9 m, Isla Tortuga, Baja California; *leg.* AK, 4 April 1980.

Identification of this distinctive species is unmistakable: white body with yellow spots, dark purple margin around the mantle, and a dark purple ring around the gills with another dark purple ring enclosing both rhinophores (Figure 3).

Morphology of the radula (Figures 4 to 7) further confirms the identification. The drawings of EDMUNDS (1971: 317, fig. 15E) are nearly identical with the tooth shapes of our specimen from the Gulf of California. The small denticles are located on the lateral outer sides of each tooth, with a shift in position to the posterior surface of the outermost teeth. The present specimen had a radular formula of 56–58 (45–49.1.45–49). The combined radular formula of the 5 known specimens is: 58–75 (42–59.1.42–59). Table 2 gives the numbers of tooth rows and teeth per half-row for all these specimens. The meristic variations fall within the acceptable range of intraspecific variation seen in dorid nudibranchs (BERTSCH, 1976a).

This is a significant addition to the tropical west American faunal province. Further research is needed to determine whether this species is actually a more common member of the faunal province than the single collecting record would indicate. It would then show a wider distribution pattern, similar to other opisthobranch species reported to occur in this region originally based on just one specimen, such as *Dolabrifera dolabrifera* (Rang, 1828) (reported by BERTSCH, 1970), *Berghia major* (Eliot, 1903) (reported by FARMER, 1966), and *Spurilla alba* (Risbec, 1928) (reported by SPHON, 1971).

Chromodoris galexorum Bertsch, 1978 (a)

This brightly colored nudibranch, with yellow borders encircling its large red spots, is known from the central and southern Gulf of California: from Bahía de los Angeles (GOTSHALL, 1982:94) to La Paz, Baja California Sur, and from Guaymas, Sonora, and nearby islands (BERTSCH, 1978a).

The following record documents its more northerly occurrence outside the Gulf of California at an offshore island along the Pacific coast of Baja California. It may well represent an extra-limital thermally anomalous "range extension" (ZINSMEISTER, 1974). The long period of elevated water temperatures caused by an El Niño phenomenon in the eastern Pacific (personal observations; HALPERN *et al.*, 1983) may explain the presence of this tropical species at the periphery of the warm temperate California faunal province.

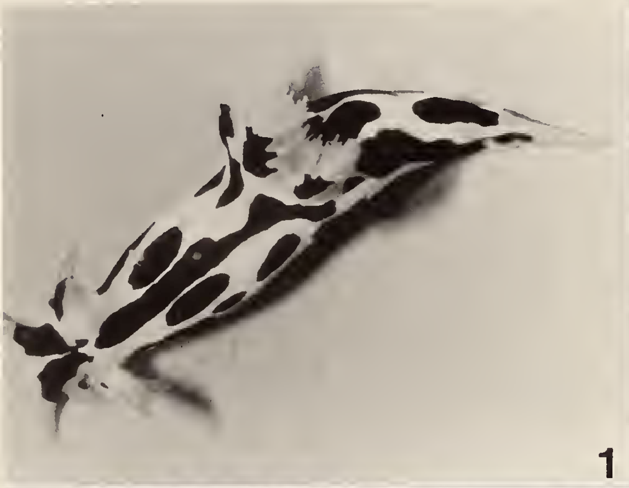
(1) 1 specimen, subtidal, 13.7 m, Old Sealing Station, on lee side of Isla Guadalupe, Baja California; *leg.* Jim Gatewood and Patricia S. Mariano, 22 August 1983.

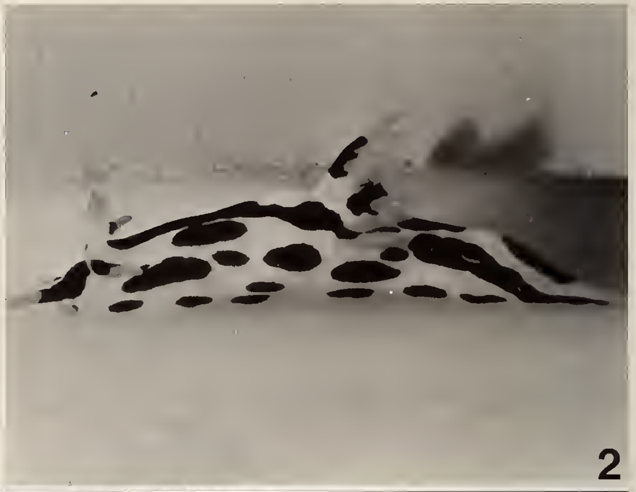
Chromodoris sphoni (Marcus, 1971)

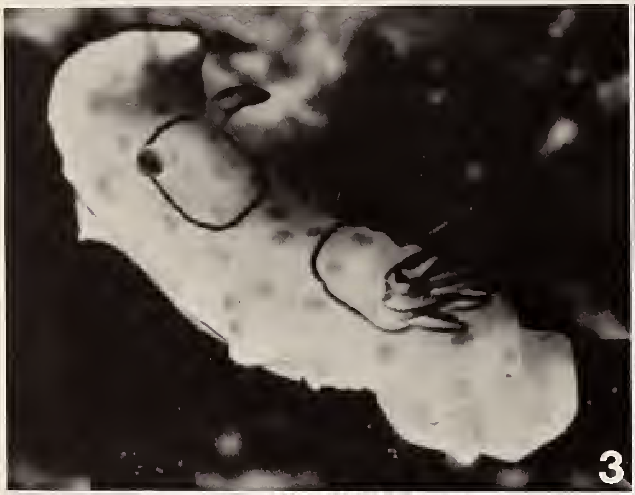
The known distribution of the red-cross colored nudibranch, *Chromodoris sphoni*, is along the mainland Pacific coast of Mexico and Central America, from Mazatlan, Sinaloa, Mexico, to Panama Bay, Panama (BERTSCH, 1978a:321). The following specimens represent its first report from inside the Gulf of California, and a northward range extension of over 670 km:

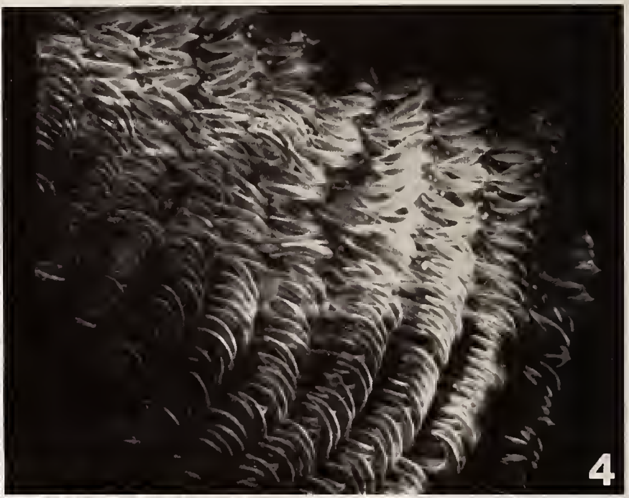
(1) 1 specimen (17 mm long), subtidal, 18 m, Isla Santa Catalina, Sonora (near Guaymas); *leg.* AK, June 1978.

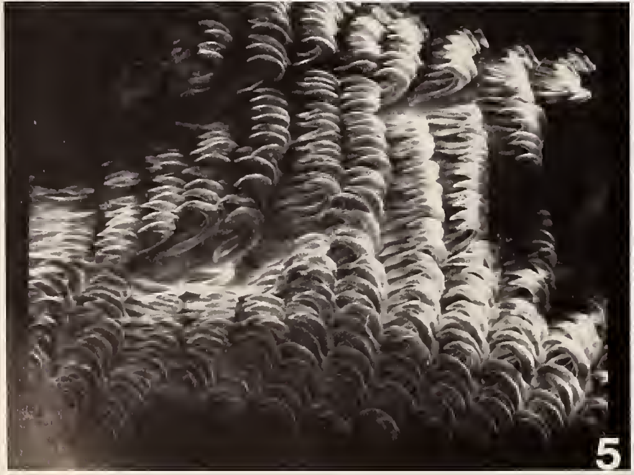
(2) Approximately 30 specimens, subtidal, 12–18 m

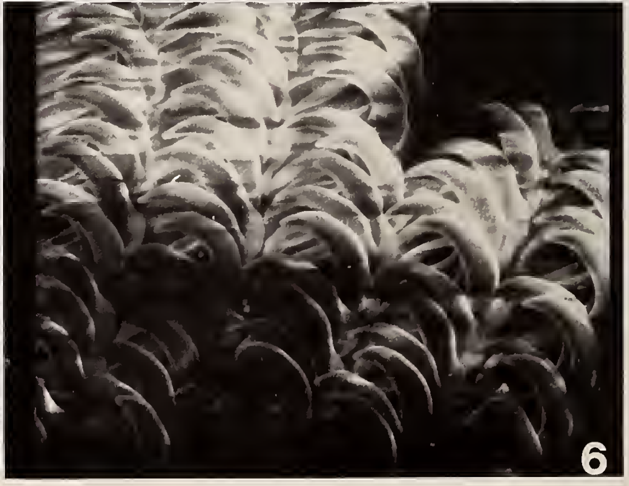












Explanations for Figures 1 to 6

Figures 1 and 2. *Trapania* sp. collected at Cabo San Lucas. Photographs by AK.

Figure 3. *Chromodoris annulata* collected at Isla Tortuga. Photograph by AK.

Figures 4 to 6. Scanning electron micrographs of the radula of *Chromodoris annulata*. Fig. 4, 111 ×; Fig. 5, 89 ×; Fig. 6, 222 ×. SEMs by HB.

deep, along the Sonora coast from Morro Colorado to Bahía San Carlos; observed by AK, April–July, 1980–1982.

Mexichromis antonii (Bertsch, 1976) (b)

This relatively rare chromodorid is known from various scattered locations in the tropical west American faunal province: 3 sites on the Baja California coastline (or nearby islands) of the western Gulf of California; from the Pacific southwest coast of Mexico (Santiago Bay, near Manzanillo, Colima) and from the Pacific coast of Costa Rica (BERTSCH, 1978b:80–82). These additional records are the first reports of the species from the state of Sonora, Mexico, and from the eastern side of the Gulf of California:

(1) 2 specimens (10 and 15 mm long), subtidal, 18 m, Isla Santa Catalina, Sonora; *leg.* AK, June 1978.

(2) 30–40 specimens, subtidal, 12–18 m, along the Sonora coastline between Morro Colorado and Bahía San Carlos; seen by AK, April–July, 1980–1982.

POROSTOMATA

DENDRODORIDIDAE

Doriopsilla rowena Marcus & Marcus, 1967

This small porostome has been collected in the northern Gulf of California from the states of Sonora and Baja California: Puerto Peñasco (MARCUS & MARCUS, 1967: 205), Guaymas, San Felipe (KEEN, 1971:830), and Bahía de los Angeles (POORMAN & POORMAN, 1978:373). This represents the first report of *Doriopsilla rowena* from the state of Sinaloa and from the southern extreme of the Gulf of California; moreover it is a southern range extension of about 680 km.

(1) 1 specimen (8 mm long), Mazatlan, Sinaloa; *leg.* Antonio J. Ferreira, March 1971.

DENDRONOTOIDA

BORNELLIDAE

Bornella sarape Bertsch, 1980

This dendronotid is known to occur on both sides of the southern part of the Gulf of California, at Bahía Carisalito (4 km north of Bahía Las Cruces), Baja California Sur, and at Sayulita, Nayarit (BERTSCH, 1980). The following data extend its known range 400 km north into the central Gulf of California, and 200 km southward along the west coast of Mexico:

(1) 6 specimens, intertidal, Bahía San Carlos, Sonora; *leg.* Roy and Forrest Poorman, December 1976.

(2) 1 specimen, intertidal, Melaque, north end of Bahía de Navidad, Jalisco; *leg.* F. Poorman, February 1976.

Bornella sarape is now known to occur along more than 1200 kilometers of the western coast of mainland Mexico, with one collecting locality near the southern tip of the Baja California peninsula.

TRITONIIDAE

Tritonia diomedea Bergh, 1894

The range of *Tritonia diomedea* along the Pacific coast of the Americas is extensive; it is often cited as occurring from the Aleutian Islands, Alaska, to the Bay of Panama, Panama (BEHRENS, 1980:80). However, its known distribution is disjunct, and should be more properly cited as occurring from Shumagin Bay, Aleutian Islands, Alaska (the type locality) to Punta Santo Domingo, on the outer coast of Baja California just north of Bahía Magdalena (KEEN, 1971:834). Between these locations many specimens have been reported (see MARCUS, 1961:32–33; MACFARLAND, 1966:226–243; and THOMPSON, 1971, for a summary of these data). It is also known from the Bay of Panama and from Japan (MARCUS, 1961; KEEN, 1971). Hence, the only published record of *Tritonia diomedea* in the tropical west American marine faunal province is from its far southern waters, in Panama. There is presently a gap in its known distribution between the outer coast of Baja California (where it is known from the Surian province) and Panama. The following collecting data represent the first report of this species from the Gulf of California and in the northern portion of the Panamic marine faunal province:

(1) 1 specimen, dredged from 100 m, 3 km south of Tetas de Cabra, Bahía San Carlos, Sonora; *leg.* Roy & Forrest Poorman, 1 November 1980.

(2) 1 specimen, Morro Colorado, Sonora; *leg.* AK, 27 December 1979.

Many specimens of this species (especially those collected in California and from Punta Santo Domingo and Panama Bay) have been obtained by dredging. *Tritonia diomedea* may well be more common in the Panamic province in deeper waters. The following data from shrimp trawls indicate a temporal variation in the occurrence of *T. diomedea*:

(3) Hundreds of specimens, dredged from 70 to 100 m in shrimp trawls, between Bahía Kino and Bahía San Carlos; observed by AK, December 1980 and 1981.

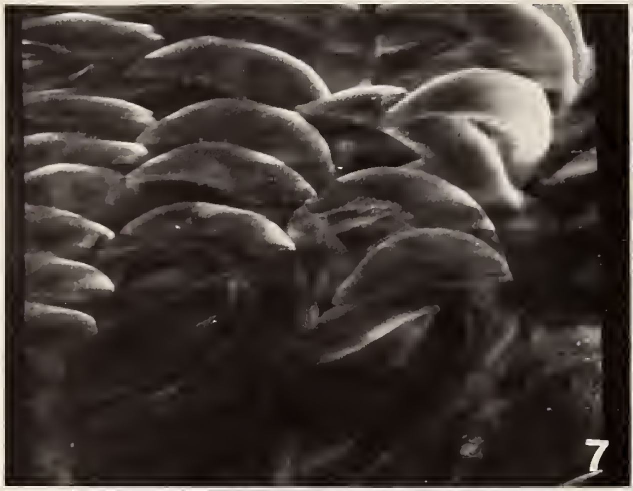
In the previous 12 years of sampling shrimp trawl material from the fishermen in this area, *Tritonia diomedea* did not appear until 1979. Not a single specimen had been observed. Since 1981 this species seems to have again disappeared from this area. During a recent trip (by AK, December 1982) not a single specimen was observed among 20 separate trawl samples.

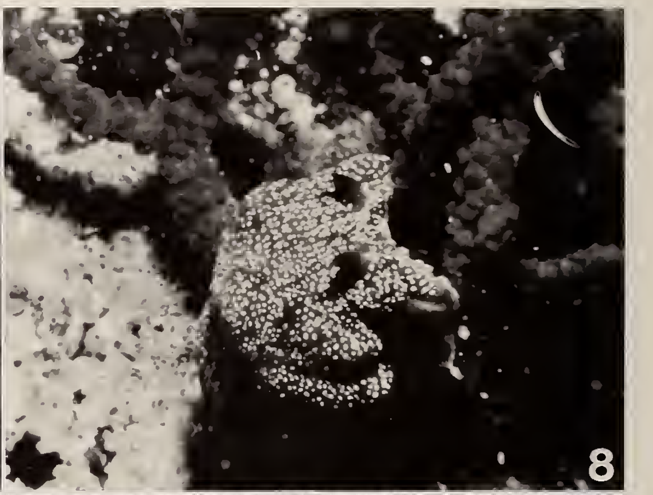
ARMINOIDA

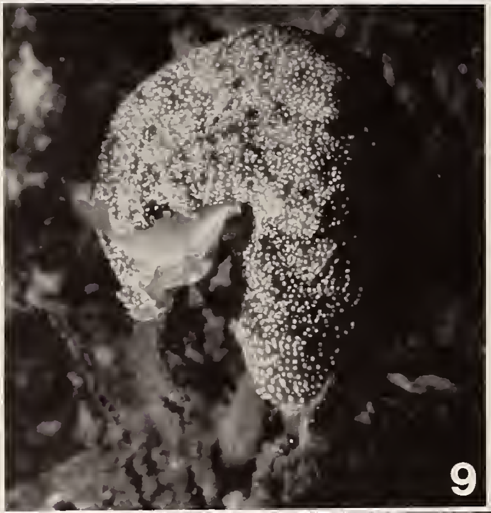
ARMINIDAE

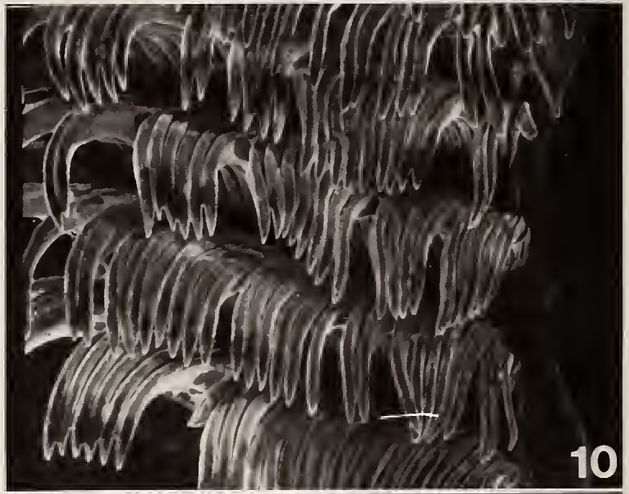
Histiomena convolvula (Lance, 1962)

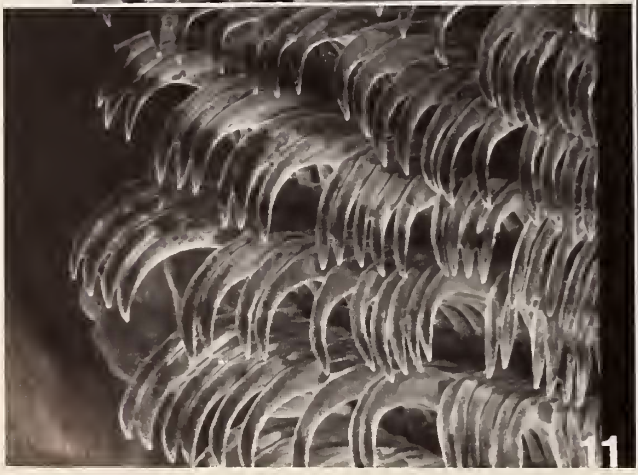
This rare sand-burrowing arminid has been reported from the Baja California coastline of the northern Gulf of California: Punta Diggs, 24 km south of San Felipe

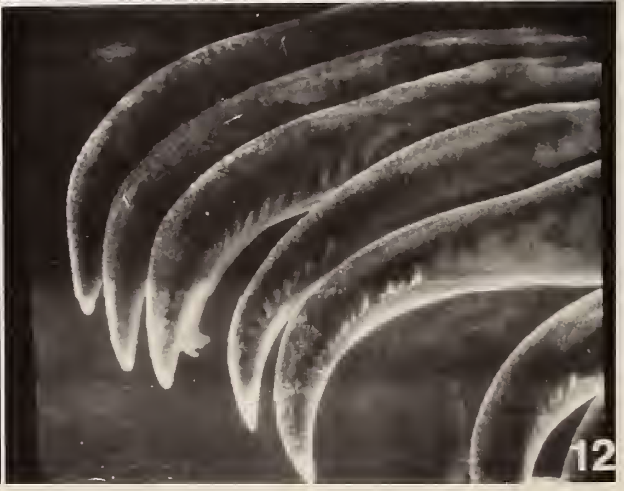










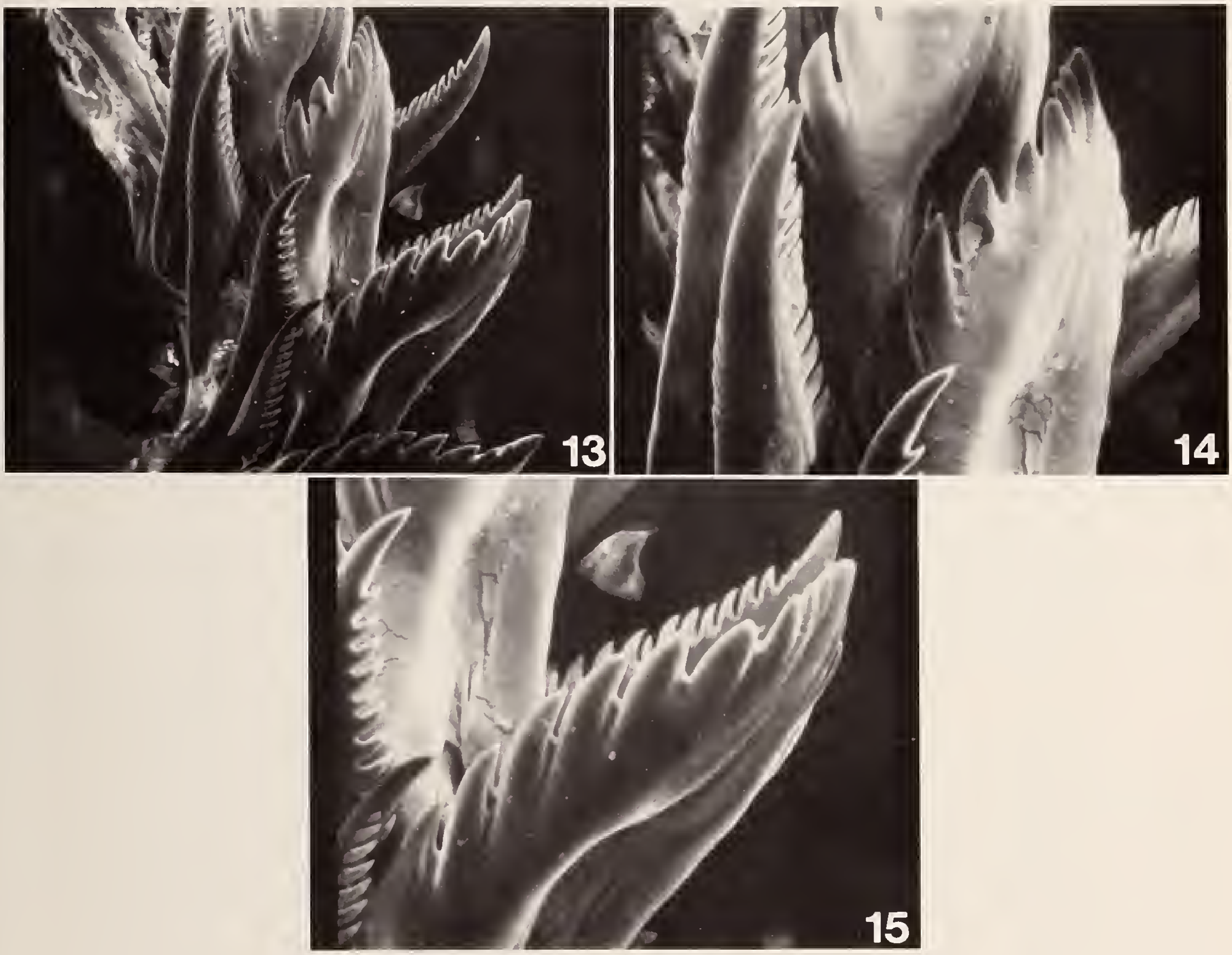


Explanations for Figures 7 to 12

Figure 7. Scanning electron micrograph of the radula of *Chromodoris annulata*, 445 ×. SEM by HB.

Figures 8 and 9. In situ underwater photographs of *Histiomena convolvula* eating the gorgonian *Muricea*. Photographs by HB.

Figures 10 to 12. Scanning electron micrographs of the radula of *Histiomena convolvula*. Fig. 10, 111 ×; Fig. 11, 111 ×; Fig. 12, 445 ×. SEMs by HB.



Explanations for Figures 13 to 15

Scanning electron micrographs of the radula of *Flabellina cynara*. Fig. 13, 111 ×; Fig. 14, 222 ×; Fig. 15, 222 ×.

(Lance, 1962), and Bahía de los Angeles (Poorman & Poorman, 1978:373). The following data further document the presence of *Histiomena convolvula* in Bahía de los Angeles and extend its range to the eastern Gulf of California, along the Sonora coastline:

(1) 1 specimen, subtidal, 7.6 m, NE of Punta Gringa, Bahía de los Angeles; *leg.* HB and Tom Smith, 11 December 1981.

(2) 3 specimens, subtidal, 9 m, NE of Punta Gringa, Bahía de los Angeles; *leg.* HB and David Myers, 25 January 1982.

(3) 1 specimen, subtidal, 29 m, Punta Doble, Bahía San Carlos, Sonora; *leg.* AK, 15 April 1979.

Three of the four specimens found by Bertsch, Smith, and Myers in Bahía de los Angeles were eating the gorgonian *Muricea cf. californica* (Figures 8 and 9). This is the first report of the prey of *Histiomena convolvula.* All four specimens in Bahía de los Angeles were encountered on the deeper seaward edge of a series of rock reefs, where the bottom becomes sandy.

The radula consists of numerous hook-like teeth (Figures 10 and 11). Lance (1962:53–54; fig. 6c) reported that some of the middle lateral teeth bear extremely fine denticles along the side of the cusp; these are clearly shown in the scanning electron micrograph (Figure 12).

AEOLIDIIDA

Flabellinidae

We follow Gosliner & Griffiths (1981) in the generic placement of these two species of *Flabellina.*

Flabellina cynara (Marcus & Marcus, 1967)

This elegant eolid is known to swim by back-and-forth strokes of its whiplike cerata, bringing head and tail rhythmically together. *Flabellina cynara* has been reported

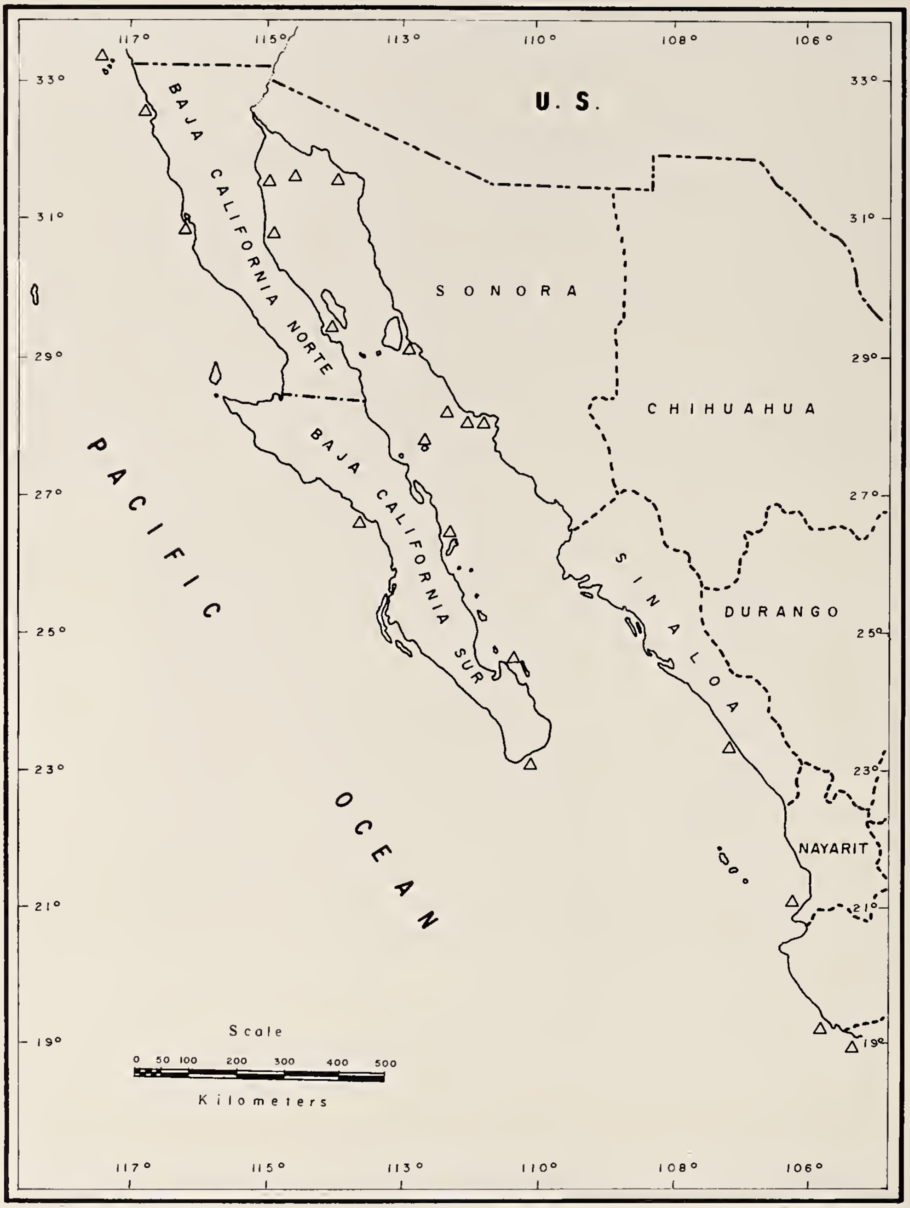


Figure 16

Map of northwestern Mexico showing collecting localities.

from various localities in the extreme northern Gulf of California: Cholla Bay, Puerto Peñasco, Sonora (MARCUS & MARCUS, 1967:220); dredged in 38 m of water off Consag Rock (FARMER, 1970:84); and dredged off Puertecitos (KEEN, 1971:836). The following records are southern range extensions of over 430 km and 210 km respectively along each side of the Gulf of California. The range of *Flabellina cynara* can now be cited as throughout the northern half of the Gulf of California.

(1) 1 specimen (45 mm long), subtidal, 12 m, Guaymas, Sonora; *leg.* AK, 28 June 1981.

(2) 1 specimen, subtidal, 15 m, S end Smith Island, Bahía de los Angeles, Baja California; *leg.* David K. Mulliner, 17 October 1979.

The triseriate radula (Figures 13 to 15) had 18 rows of teeth; it was a larger specimen than the holotype which had 16 rows of teeth (MARCUS & MARCUS, 1967:221). Each central tooth bears 7–10 denticles (rather than just the 7–9 originally reported). The scanning electron micrographs (Figures 13 to 15) show a morphological variation that was not reported in the light-microscopy-based original description. Some of the lateral teeth, "obtuse-angled triangles" (MARCUS & MARCUS, 1967:221), bear 2 rows of denticles—the large and obvious grasping denticles below the cusp on the inner surface and a row of 5 or 6 minute denticles on the outer slope of the tooth (Figures 13 and 14). As can be seen, not all teeth show this feature.

Flabellina iodinea (Cooper, 1863)

The range of *Flabellina iodinea* has been cited as Vancouver Island, British Columbia, Canada, to the Gulf of California, Mexico (BRUSCA, 1980:194), to Puerto Peñasco (BEEMAN & WILLIAMS, 1980:336–337), or to Bahía de los Angeles (FARMER, 1980:122). However, known distribution records do not exist from the southern coasts of Baja California, nor in the southern Gulf of California. Previous collecting data should have been summarized to reflect this disjunct known distribution: from Vancouver Island to Cabo San Quintín (SPHON, 1972:64; BEHRENS, 1980:92; MCDONALD & NYBAKKEN, 1981:60), including the Coronados Islands (LANCE, 1961) and Ensenada (FARMER & COLLIER, 1963) in northern Baja California. This species has been reported in the Gulf of California from two locations: Puerto Peñasco (MARCUS & MARCUS, 1967:218) and Bahía de los Angeles (POORMAN & POORMAN, 1978:373; HAMANN, 1981).

The following data, therefore, are especially significant because they establish its presence at intermediate localities along the Pacific coast of Baja California, at the extreme southern tip of the peninsula, and from a second locality in the eastern Gulf of California:

(1) BEHRENS (1983) reported collecting specimens at Islas San Martin, San Benitos, and Cedros, Baja California.

(2) 3 specimens, intertidal, El Tomatal, Baja California; HB, 14 June 1983.

(3) 1 specimen, subtidal, 76 m, Cabo San Lucas, Baja California Sur; *leg.* AK, August 1972.

(4) Punta Doble, Bahía San Carlos, Sonora; *leg.* AK. various: 1 specimen, 29 m, April 1983; 1 specimen, 16.8 m, December 1978; 3 specimens, 29 m, April 1979; more than 30 specimens, subtidal, April 1982.

Flabellina iodinea occurs rarely in the Gulf of California, but usually under situations of colder water, especially in deeper subtidal waters (our records; also those of POORMAN & POORMAN, 1978, who dredged *F. iodinea* from Bahía de los Angeles; and HAMANN, 1981, who reported collecting it below the thermocline at 15 m in Bahía de los Angeles). The single specimen collected at Puerto Peñasco is an exception to this generalization. With current knowledge, we can best describe the range of *F. iodinea* as common throughout the Oregonian and Californian marine faunal provinces, from Vancouver Island, British Columbia, to Isla Cedros, Baja California; rarer in the northern Panamic province (throughout the Gulf of California) in deeper or colder waters.

GLAUCIDAE

Glaucus atlanticus Forster, 1777

This species is a pelagic, circumtropical member of the wind-driven Portuguese man-of-war (*Physalia*) community (BERTSCH & JOHNSON, 1981:100). The toxic stinging capability of *Glaucus,* which stores the largest and most potent nematocysts of *Physalia,* is well documented (THOMPSON & BENNETT, 1969; BINGHAM & ALBERTSON, 1974).

In the eastern Pacific it has been collected off west-central America, from latitude 24°N, south to latitude 8°S (KEEN, 1971:840). These data are the first records from well inside the Gulf of California:

(1) Numerous specimens (10–20 mm), off Bahía San Carlos, among drifts of *Physalia* and *Porpita*; observed by AK, summers 1978, 1979, and 1981.

(2) Several hundred specimens (10–20 mm), off Cabo San Lucas, among drifting *Physalia* and *Porpita*; observed by AK, summers 1978, 1979, and 1981.

AEOLIDIIDAE

Baeolidia nodosa (Haefelfinger & Stamm, 1958)

This species is widely distributed in the tropical east and west Atlantic, including the Mediterranean and Caribbean Seas (HAEFELFINGER & STAMM, 1958; MARCUS & MARCUS, 1970:89; SCHMEKEL, 1972:152–159; TEMPLADO, 1981). In the central Pacific Ocean it has been reported from Oahu and Kauai, Hawaiian Islands (KAY, 1979:488; GOSLINER, 1980:66–69; BERTSCH & JOHNSON, 1981:102), and in the eastern Pacific in the Gulf of California from Bahía Las Cruces, Baja California Sur (BERTSCH, 1972:104–105).

The following record is only the second report of this species in the Gulf of California, and a northward range extension (of over 400 km) from Bahía Las Cruces to the Sonoran coast:

(1) 1 specimen, on floating *Sargassum,* off Bahía San Carlos, Sonora; *leg.* AK, June 1978.

Spurilla neapolitana (Delle Chiaje, 1823)

This eolid has been reported numerous times throughout the tropical Atlantic, including the Mediterranean and Caribbean Seas (*cf.* GOSLINER, 1980:64–65, for a summary of the literature and synonymy). Moreover, this species has been reported from the central Pacific (Oahu, Hawaiian Islands; KAY, 1979:489; GOSLINER, 1980) and the eastern Pacific ("Gulf of California"; BERTSCH, 1979: 59). It thus shares a similar distribution pattern with *Baeolidia nodosa*: throughout the tropical Atlantic (and adjacent seas); Hawaii, and Gulf of California in the central and eastern Pacific. This species' distribution is not appropriately termed "circumtropical" (KAY, 1979;

Gosliner, 1980) since it has not yet been reported from the Indo-West Pacific.

The following data detail known collecting sites in the Gulf of California:

(1) 1 specimen (55 mm long), intertidal, Morro Colorado, Sonora; *leg.* AK, 19 December 1977 (deposited egg mass in aquarium).

(2) 1 specimen, subtidal, 9 m, off Isla San Nicholas, Bahía San Carlos, Sonora; *leg.* AK, December 1979 (laid eggs in aquarium).

(3) 3 specimens (25 mm long), intertidal, Puerto Escondido (24 km south of Loreto), Baja California Sur; *leg.* Robin Hugh Alexander Boroch and Deborah J. Kasten, 28 June 1980.

ACKNOWLEDGMENTS

We thank our scuba diving partners for assisting us in our field work in the Gulf of California: Tom Smith, David Myers, and Myra Muramoto.

We are grateful to Ramon Moreno Castillo and Gilberto Fuentes G., scientific illustrators for the Instituto de Investigaciones Oceanologicas, and David K. Mulliner, of San Diego, for their artistic and photographic assistance. We thank Luis Aguilar Rosas, research scientist of the I.I.O., for his support.

We were privileged to be able to include the data of Antonio J. Ferreira, David K. Mulliner, Roy and Forrest Poorman, Robin Hugh A. Boroch and Deborah J. Kasten, and Jim Gatewood.

We thank David W. Behrens, Sandra Millen, and Terrence M. Gosliner for assistance with the manuscript. The senior author is grateful to Anthony D'Attilio, Hugh Bertsch, Nancy Love, and Fay Wolfson.

LITERATURE CITED

Aboul-Ela, I. A. 1959. On the food of nudibranchs. Biol. Bull. 117(3):439–442.

Barnard, K. H. 1927. South African nudibranch Mollusca, with descriptions of new species, and a note on some specimens from Tristan d'Acunha. Ann. S. Afr. Mus. 25(1): 171–215 (not seen; ref. *fide* Russell, 1971, Index Nudibranchia).

Beeman, R. D. & G. C. Williams. 1980. Opisthobranchia and Pulmonata: the sea slugs and allies. Pp. 308–354. *In:* R. H. Morris, D. P. Abbott & E. C. Haderlie (eds.), Intertidal invertebrates of California. Stanford University Press: Stanford.

Behrens, D. W. 1980. Pacific coast nudibranchs: a guide to the opisthobranchs of the northeastern Pacific. Sea Challengers: Los Osos, Calif. 112 pp.

Behrens, D. W. 1983. Report on the 1982 outer Baja California expedition. Opisthobranch Newsletter 15(4):18–19.

Bergh, L. S. R. 1894. Reports on the dredging operations off the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U. S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. Tanner, U.S.N., commanding. XIII. Die Opisthobranchien. Bull. Mus. Comp. Zool. (Harvard) 25 (10):125–233.

Bertsch, H. 1970. *Dolabrifera dolabrifera* (Rang, 1828): range extension to the eastern Pacific. Veliger 13(1):110–111.

Bertsch, H. 1972. Two additions to the opisthobranch fauna of the southern Gulf of California. Veliger 15(2):103–106.

Bertsch, H. 1976a. Intraspecific and ontogenetic radular variation in opisthobranch systematics (Mollusca: Gastropoda). Syst. Zool. 25(2):117–122.

Bertsch, H. 1976b. A new species of *Chromodoris* (Opisthobranchia: Nudibranchia) from tropical west America. Veliger 19(2):156–158.

Bertsch, H. 1978a. The Chromodoridinae nudibranchs from the Pacific coast of America.—Part II. The genus *Chromodoris.* Veliger 20(4):307–327.

Bertsch, H. 1978b. The Chromodoridinae nudibranchs from the Pacific coast of America.—Part III. The genera *Chromolaichma* and *Mexichromis.* Veliger 21(1):70–86.

Bertsch, H. 1979. Tropical faunal affinities of opisthobranchs from the Panamic province (eastern Pacific). Nautilus 93(2–3):57–61.

Bertsch, H. 1980. A new species of *Bornella* from tropical west-America (Mollusca, Opisthobranchia). Spixiana 3(1): 33–42.

Bertsch, H. & S. Johnson. 1981. Hawaiian nudibranchs. Oriental Publ. Co.: Honolulu. 112 pp.

Bingham, F. O. & H. D. Albertson. 1974. Observations on beach strandings of the *Physalia* (Portuguese-man-of-war) community. Veliger 17(2):220–224.

Brusca, R. C. 1980. Common intertidal invertebrates of the Gulf of California. 2nd edition. University of Arizona Press: Tucson. xx + 513 pp.

Cockerell, T. D. A. 1901. Three new nudibranchs from California. J. Malacol. 8(3):85–87.

Cooper, J. G. 1863. Some genera and species of California Mollusca. Proc. Calif. Acad. Natur. Sci. 2:202–207.

Edmunds, M. 1971. Opisthobranchiate Mollusca from Tanzania (Suborder: Doridacea). Zool. J. Linn. Soc. Lond. 50(4): 339–396.

Eliot, C. 1903. On some nudibranchs from East Africa and Zanzibar. Part II. Proc. Zool. Soc. Lond. 1903(1):250–257.

Eliot, C. 1904. On some nudibranchs from East Africa and Zanzibar. Part IV. Dorididae Cryptobranchiatae, II. Proc. Zool. Soc. Lond. 1904(1):380–406.

Farmer, W. M. 1966. Range extension of *Berghia amakusana* (Baba) to the east Pacific. Veliger 9(2):251.

Farmer, W. M. 1970. Swimming gastropods (Opisthobranchia and Prosobranchia). Veliger 13(1):73–89.

Farmer, W. M. 1980. Sea-slug gastropods. W. M. Farmer Enterprises, Inc.: Tempe, Arizona. 177 pp.

Farmer, W. M. & C. L. Collier. 1963. Notes on the Opisthobranchia of Baja California, Mexico, with range extensions. Veliger 6(2):62–63.

Forster, G. 1777. A voyage round the world, in His Britannic Majesty's Sloop, Resolution, commanded by Cpt. James Cook, during the years 1772, 3, 4, and 5. B. White, J. Robson, P. Elmsly, and G. Robinson: London. Vol. I: xx + 603 pp.

Gohar, H. A. F. & I. A. Aboul-Ela. 1957. The development of three chromodorids (with the description of a new species). Publ. Mar. Biol. Sta. Al-Ghardaqa, Egypt 9:203–228.

Gosliner, T. M. 1980. Systematics and phylogeny of the Aglajidae (Opisthobranchia: Mollusca). Zool. J. Linn. Soc. 68:325–360.

Gosliner, T. M. & R. J. Griffiths. 1981. Description and revision of some South African Aeolidacean Nudibranchia (Mollusca, Gastropoda). Ann. S. Afr. Mus. 84(2):105–150.

Gotshall, D. W. 1982. Marine animals of Baja California. A guide to the common fish and invertebrates. Sea Challengers: Los Osos, Calif. 112 pp.

Haefelfinger, H-R. & R. A. Stamm. 1958. *Limenandra nodosa* gen. et spec. nov. (Nudibranchia, Aeolidiidae prop.), un opisthobranche nouveau de la Mediterranee. Vie et Milieu 9(4):418–423.

Halpern, D. *et al.* 1983. Oceanographic observations of the 1982 warming of the tropical eastern Pacific. Science 221(4616):1173–1175.

Hamann, J. 1981. Range extensions of northeastern Pacific opisthobranchs. Opisthobranch Newsletter 13(6):21.

Kay, E. A. 1979. Hawaiian marine shells. Reef and shore fauna of Hawaii. Section 4: Mollusca. Bernice P. Bishop Museum Spec. Publ. 64(4):xviii + 653 pp.

Keen, A. M. 1971. Sea shells of tropical west America. Marine Mollusks from Baja California to Peru. 2nd edition. Stanford University Press: Stanford, Calif. xiv + 1064 pp.

Lance, J. R. 1961. A distributional list of southern California opisthobranchs. Veliger 4(2):64–69.

Lance, J. R. 1962. A new species of *Armina* (Gastropoda: Nudibranchia) from the Gulf of California. Veliger 5(1): 51–54.

MacFarland, F. M. 1966. Studies of opisthobranchiate mollusks of the Pacific coast of North America. Mem. Calif. Acad. Sci. 6:xvi + 546 pp.

Marcus, Er. 1961. Opisthobranch mollusks from California. Veliger 3(Suppl. Pt. 1):1–85.

Marcus, Er. & Ev. Marcus. 1970. Opisthobranchs from Curaçao and faunistically related regions. Stud. Fauna Curaçao and other Carib. Isl. 33(122):1–129.

Marcus, Ev. 1971. On some euthyneuran gastropods from the Indian and Pacific Oceans. Proc. Malacol. Soc. Lond. 39(5):355–369.

Marcus, Ev. & Er. Marcus. 1967. American opisthobranch mollusks. Stud. Trop. Oceanogr. Miami 6:viii + 256 pp.

McDonald, G. R. & J. W. Nybakken. 1981. Guide to the nudibranchs of California. American Malacologists, Inc.: Melbourne, Florida. 72 pp.

Poorman, F. L. & L. H. Poorman. 1978. Additional molluscan records from Bahía de los Angeles, Baja California Norte. Veliger 20(4):369–374.

Rang, S. 1828. Histoire naturelle des aplysiens. Impr. Firmin Didot: Paris. 7 + 83 pp.

Risbec, J. 1928. Contribution à l'étude des nudibranches Neo-Calédoniens. Faune Colon. Française 2(1):1–328.

Rudman, W. B. 1973. Chromodorid opisthobranch Mollusca from the Indo-West Pacific. Zool. J. Linn. Soc. Lond. 52(3): 175–199.

Schmekel, L. 1972. Anatomie der Genitalorgane von Nudibranchiern (Gastropoda, Euthyneura). Pubbl. Staz. Zool. Napoli 38(1):120–217.

Sphon, G. G. 1971. New opisthobranch records for the eastern Pacific. Veliger 13(4):368–369.

Sphon, G. G. 1972. An annotated checklist of the nudibranchs and their allies from the West Coast of North America. Opisthobranch Newsletter 4(10 + 11):53–79.

Templado, J. 1981. Nuevo opistobranquio para la malacofauna Ibérica. Segundo Simposio Ibérico de Estudios del Bentos Marino—Resumenes.

Thompson, T. E. 1971. Tritoniidae from the North American Pacific coast (Mollusca: Opisthobranchia). Veliger 13(4): 333–338.

Thompson, T. E. & I. Bennett. 1969. *Physalia* nematocysts: utilized by mollusks for defense. Science 166(3912):1532–1533.

Zinsmeister, W. J. 1974. A new interpretation of thermally anomalous molluscan assemblages of the California Pleistocene. J. Paleontol. 48(1):84–94.